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Disparities in Major Joint Replacement Surgery among Adults with Medicare Supplement Insurance

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Abstract

The objective of this study was to determine if disparities in hip and knee replacement surgery exist among osteoarthritis patients with AARP-branded Medicare supplement plan (ie, Medigap) coverage provided by UnitedHealthcare. Patients were selected into the study if they had 1 or more medical claims with a diagnosis of osteoarthritis from July 1, 2006 to June 30, 2007. Logistic regression analyses tested for age-, sex-, race-, or income-related differences in the likelihood of receiving a hip or knee replacement surgery. The regression models controlled for socioeconomics, health status, type of supplement plan, and residential location. Of the 2.2 million Medigap insureds eligible for this study, 529,652 (24%) had osteoarthritis. Of these, 32,527 (6.1%) received a hip or knee replacement. Males were 6% ($P < 0.001$) more likely than females to have a replacement surgery. Patients living in minority or lower income neighborhoods were less likely to receive a hip or knee replacement. Supplement plan type was not a strong predictor of the likelihood of hip or knee replacement. Disparities were much greater by comorbid condition and residential location. Disparities in hip and knee replacement surgery existed by age, sex, race, and income levels. Larger disparities were found by residential location and comorbid condition. Interventions are being considered to address these disparities. (*Population Health Management* 2011;14:231–238)

Introduction

Major joint (hip and knee) replacement surgeries are commonly considered for patients who suffer from osteoarthritis.[1] There are 3 common forms of hip and knee replacements: total replacement, when an arthritic or damaged joint is entirely removed and replaced with a prosthesis; partial replacement, a less invasive surgical treatment during which only the most damaged joint areas are replaced; and revision replacement, which occurs when replacing a previously implanted prosthesis.[2] These surgeries are often safe and effective treatments for alleviating pain, improving function, and increasing health-related quality of life. These surgeries have low risk for complications despite variation in patient status, type of prosthesis implanted, orthopedic surgeon, or facility.[3,4]

Several studies have documented increased rates of total hip and knee replacement over the past several decades.[5–8] Similarly, rates of partial and revision hip and knee replacement have increased during this time.[2,7,9] Total joint replacement surgeries are the most common type of joint replacement by far, with the most recent estimates indicating that over 300,000 total knee replacements[4] and 170,000 total hip replacements[2] are performed each year. The use of these procedures is most heavily concentrated in adults ages 65 and older.[7]

Despite procedure efficacy and potential for quality of life improvement, many racial/ethnic and socioeconomic disparities in the use of major joint replacement exist. For example, total hip[8,10–14] and primary knee[5,6,12–16] replacement rates are higher for whites than for minorities. Such disparities also exist in revision knee[5,16] and hip[17] replacement procedures. Furthermore, these racial disparities have remained consistent over time,[8] and low-income adults are less likely to receive primary and revision hip and knee replacement surgeries.[16,17]

Prior research has shown consistent patterns of procedure use, regardless of sex and age group. Several studies have documented women having higher rates of primary and revision hip and knee replacement surgeries.[5–7,10,16,17] Disparities

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exist by age, with the use of primary and revision hip and knee replacements increasing with age.[13,16,17] Replacement rates are generally highest in the age 75–79 group[5,7,16,17] and decline with increasing age.[10,16,17]

Utilization of these services represents a substantial economic impact on Medicare. The economic burden of such procedures likely impacts utilization, resulting in socioeconomic disparities in care. Although Medicare pays the majority of the bill for these surgeries, usually about 80%,[18] beneficiaries still face high out-of-pocket costs,[5] which likely influence treatment decisions. Medigap covers some of these out-of-pocket costs, with the coverage amount depending on the particular Medigap plan chosen.

Most of the literature examining disparities in the rates of hip and knee replacement surgeries has focused on the Medicare fee-for-service (FFS) population; whereas few studies investigate if disparities vary by Medigap source or plan type.[19] Of those with FFS Medicare coverage, one study showed that only 9% did not have supplemental coverage of some sort, while 39% had employer-sponsored supplement coverage, 27% purchased Medigap coverage, 17% had Medicaid coverage, and 7% had other non-Medicare coverage. Thus, those with Medigap coverage represent a significant portion of the Medicare population.[20] We hypothesize that patient demographics, health status, and benefit levels likely differ by Medigap source and plan type and, therefore, may impact disparities in care. Such relationships have not been examined solely for Medicare beneficiaries who purchase Medigap coverage.

The objective of this study is to determine whether age, sex, race/ethnicity, or income-related disparities in hip and knee replacement exist among osteoarthritis patients who purchase Medigap coverage, and to compare these results with the Medicare population as a whole. For the purposes of this discussion, Medigap supplement coverage as described hereafter refers to individuals who purchase such coverage. This study is part of the AARP Health Care Transformation Diversity Initiative, which is designed to examine the presence and nature of disparities in those who have AARP-branded Medigap coverage provided by UnitedHealthcare and, if found, will look to develop programs to address these disparities.

Materials and Methods

Data sources

Currently, about 2.9 million individuals have AARP-branded Medigap coverage insured by UnitedHealthcare Insurance Company (for New York residents, UnitedHealthcare Insurance Company of New York). These plans are offered in all 50 states, Washington, DC, and numerous US territories. Blinded patient data for this study were obtained from membership, facility, and professional claims provided by Ovations Insurance Solutions, a division of UnitedHealth Group.

Patient selection

Patients were selected into the study if they had 1 or more health care claims with a primary diagnosis of osteoarthritis at any time from July 1, 2006 to June 30, 2007. Patients were identified as having a hip or knee replacement if they had 1 or more claims during this study period that indicated either a total, partial, or revision replacement. The diagnosis and procedures codes used to identify these patients are listed in Table 1.

Patients were excluded if they did not have 12 months of continuous plan enrollment during the study period or were younger than 65 years of age as of July 1, 2006, or if they were missing any of the pertinent data fields to be described.

Variables expected to influence surgical rates

Patient demographics. Patient demographics included age, sex, location, and Medigap plan type. Ages were denoted as being in one of 3 possible ranges: 65–74, 75–84, or 85 and older. These age groups are frequently used in studies of the elderly. A binary indicator was used to denote whether the patient's sex was male or female.

There are 12 standard Medigap plans into which patients can enroll. They are referred to as plans A–L and have benefit structures that are consistent across carriers and locations in the United States. Each plan varies in the level of coverage and benefit provided, with Plan A being one of the most basic.

A few states (eg, Massachusetts, Minnesota, Wisconsin) have developed federally approved nuances to their Medigap plans that might influence health care utilization. These plans were separated into those that existed before standardization (pre-standard) and all others (eg, waiver and nonstandard plans).

We controlled for residence in areas in which pilot disease management programs will operate for Medigap insureds in December 2008 and beyond (ie, parts of New York, Ohio, Florida, California, and North Carolina), and for residence in 5 other areas in which patient satisfaction surveys will be completed for Medigap patients in 2009 and beyond (Arizona, Colorado, Missouri, New Jersey, and Texas). This may help determine whether the rollout of those programs should be adjusted to account for disparities issues.

Next, health care utilization often differs by location, so 2 sets of variables were used to adjust for where patients reside. To control for variations across the country, binary variables for each state were included to denote each patient's residence. Further, patients were classified as living in rural areas (fewer than 10,000 inhabitants), micropolitan areas (at least 10,000 but fewer than 50,000) or metropolitan areas (more than 50,000 inhabitants). These variables controlled for the impact of population size on surgical rates.

Table 1. Diagnoses and Procedure Codes Used to Find Sample Members with Major Joint Replacement Surgery

Diagnosis or Procedure	*Code*
Osteoarthritis	ICD-9-CM 715.00–715.99
Total hip replacement	CPT codes 27130–27132
Revision total hip	CPT codes 27134–27138
Partial hip replacement	CPT codes 27125, 27236
Total knee replacement	CPT code 27447
Revision total/partial knee	CPT codes 27486–27487
Partial knee replacement	CPT codes 27437–27446

CPT, Current Procedural Terminology; ICD-9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*.

Socioeconomic factors. Because self-reported socioeconomics were not available for Medigap insureds, geocoding was used to estimate the race and income of each sample member. Geocoding is a process that estimates certain characteristics of a person based on the characteristics of his or her area or neighborhood. Geocoding has been shown to be useful for measuring quality-related disparities in care.[21,22] In our study, sample members were assigned to racial categories and income levels based on their zip code. The 2000 US census data were used as input into this process.

Assignment to a racial category was based upon the percentage of nonwhite residents within the patient's zip code. Minority nonwhite population groups included African Americans, Hispanic Americans, Asian Americans, Hawaiians/Pacific Islanders, Native Americans, and Others. Patients were defined as living in a "high minority" area if 60% or more of the population in their zip code was in one of the nonwhite minority groups, based on the census data. Patients were assigned as living in a "low minority" area when 15% or less of the population in their zip code was in one of the non-white minority groups. All other patients were assigned as living in "standard" or "middle" zip code areas.

Patients were assigned to one of 4 income categories based on the average household income of their zip code. Income categories were low (less than $29,797), lower-medium (between $29,797 and $36,250), upper-medium (between $36,250 and $45,762), and high (over $45,762). These categories represent the quartile cut points of the income distribution for the population in this sample.

Health status. To control for varying levels of health status across sample members, an aggregate measure for physical and mental health was produced using the Symmetry Episode Treatment Group (ETG) software. ETGs are generated by combining demographic and diagnostic data from facility and professional claims into mutually exclusive categories that describe episodes of treatment for many conditions. Several studies have used ETG software to aggregate claims information.[23–25]

After assigning patients to ETGs, an Episode Risk Group (ERG) score was created for each sample member. The ERG score is a variable that predicts how costly a patient is expected to be in the next year, based on his or her age, sex, and medical condition. This variable provides a rough proxy for health status under the assumption that healthier patients generally are expected to cost less in the future year.

Although the ERG score controls for the overall health status of each patient, it can be important to control for specific comorbidities that might influence surgery rates. Therefore, binary indicators were constructed to denote if each patient received care for diabetes, obesity, coronary artery disease (CAD), congestive heart failure (CHF), hypertension, chronic obstructive pulmonary disease (COPD), or mental health problems. These conditions were chosen by a clinical team as those that most commonly afflict a Medicare population and as those that might influence the utility or ability to carry out a surgical procedure. The literature suggests these conditions occur at about the same rates in Medicare patients with and without Medigap coverage.[26–28] The ETG software was used to find patients with these conditions.

Primary data analyses

Univariate analyses were first used to describe patients in the study and their utilization of hip or knee replacement surgery. Chi-square and Student *t* tests were used to test for differences in categorical and continuous variables, respectively. Then, to eliminate the confounding effects of the demographic, socioeconomic, and health status variables mentioned, a logistic regression analysis was used to estimate the impact of age, sex, race, and income on the likelihood of having a hip or knee surgery. All analyses were performed using SAS software version 9.1 (SAS Institute Inc., Cary, NC).

Sensitivity analyses

The primary data analyses combined all types of hip and knee procedures together. A distinction was not made between patients who received a hip or knee replacement, or between the type of replacement (total, partial, or revision). If the likelihood of each of these varies differently by patient demographics, socioeconomic factors, or health status, then combining them into a single model may produce misleading results. Therefore, a sensitivity analysis was conducted to estimate the impact of these variables on receipt of each type of surgical procedure.

Results

Characteristics of the sample members

After applying the exclusion criteria, 2.2 million AARP Medigap members were eligible for this study, 529,652 (24%) of whom were diagnosed with osteoarthritis. Of those with osteoarthritis, 32,527 (about 6%) received a hip or knee replacement surgery.

The numbers of patients in each demographic, socioeconomic, and health status category are shown in Table 2. Osteoarthritis patients were primarily female (70%) and most heavily concentrated in the age 65–84 group (77%). Nearly half resided in zip codes with the highest income bracket, and only 3% of patients resided in high-minority areas. Over half the patients were enrolled in Medigap plan types denoted as plans C, F, or J; these plans are the only ones that provide complete or near complete first-dollar coverage for Medicare-covered services.[32] Over 75% of the patients lived in urban metropolitan areas, and the most common states of residence were Florida, New York, and New Jersey. The most common comorbidities were hypertension (58% of patients) and CAD (29% of patients).

Results of the primary analyses

Table 3 depicts the results of the logistic regression used for the primary analysis. The logistic regression estimated the impact of each independent variable on the likelihood of having surgery, while the other independent variables were fixed. This table presents the regression coefficients, standard errors, significance levels, and relative risk ratios (RRR) for each independent variable. The RRR represent the ratio of the adjusted probabilities and can be interpreted as the relative odds that one group of patients (eg, males) received hip or knee replacement surgery, as opposed to not receiving surgery, compared with a reference group (eg, females).

Table 2. Characteristics of Patients with Osteoarthritis Who Received Hip/Knee Replacement Surgery

Characteristic		N *(%)*	*Percentage receiving hip/knee surgeries*	*Standard Deviation*	P *value*
Age Group	65–74 years	173,358 (33)	7.69%	0.2665	–
	75–84 years	231,140 (44)	6.36%	0.2441	<0.001
	85 years and older	125,154 (24)	3.59%	0.1860	<0.001
Sex	Female	370,681 (70)	5.88%	0.2353	–
	Male	158,971 (30)	6.74%	0.2507	<0.001
Annual Income	High income	239,249 (45)	6.11%	0.2396	–
	Upper medium income	132,563 (25)	6.37%	0.2442	<0.001
	Lower medium income	103,965 (20)	6.22%	0.2414	0.177
	Low income	53,875 (10)	5.56%	0.2291	<0.001
Minority Status	Low minority	326,788 (62)	6.45%	0.2456	–
	Standard minority	186,949 (35)	5.73%	0.2324	<0.001
	High minority	15,915 (3)	4.70%	0.2116	<0.001
Medigap Plan	A	13,965 (3)	5.39%	0.2259	–
	B	13,172 (2)	6.04%	0.2382	<0.001
	C	116,163 (22)	6.17%	0.2406	<0.001
	D	11,505 (2)	6.01%	0.2376	<0.001
	E	16,775 (3)	5.71%	0.2321	<0.001
	F	159,833 (30)	6.88%	0.2532	<0.001
	G	12,248 (2)	6.34%	0.2436	<0.001
	H	4,458 (<1)	6.10%	0.2394	<0.001
	I	21,299 (4)	6.43%	0.2452	<0.001
	J	53,438 (10)	7.36%	0.2611	<0.001
	K	113 (<1)	7.08%	0.2576	<0.001
	L	157 (<1)	8.92%	0.2859	<0.001
	Pre-Standardized	95,300 (18)	4.12%	0.1988	<0.001
	Waiver and nonstandard plans	11,226 (2)	7.67%	0.2661	<0.001
Programming	No Disease Management	400,018 (76)	6.31%	0.2432	–
	DM Pilot	47,642 (9)	4.94%	0.2167	<0.001
	Survey Pilot	81,992 (15)	5.82%	0.2341	<0.001
Urban Status	Metropolitan	420,393 (79)	5.97%	0.2369	–
	Micropolitan	67,217 (13)	6.73%	0.2506	<0.001
	Rural	42,042 (8)	6.91%	0.2536	<0.001
Comorbidities	ERG (Standardized Score)	529,567	1.3153	1.1553	<0.001
	Mental Health	38,722 (7)	5.99%	0.2603	<0.001
	Hypertension	305,818 (58)	7.43%	0.4940	<0.001
	CAD	151,195 (29)	7.11%	0.4516	<0.001
	Diabetes	85,027 (16)	6.57%	0.3671	<0.001
	CHF	39,155 (7)	5.87%	0.2617	<0.001
	COPD	17,516 (3)	5.67%	0.1788	<0.001
	Obesity	6,206 (1)	13.04%	0.1076	<0.001

Reference groups: Age: 65–74; Sex: Female; Annual Income: High income; Minority status: Low minority; Medigap Plan: A; Programming: No Disease Management; Urban status: metropolitan; Comorbidities: not present.

CAD, coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; DM, disease management; ERG, Episode Risk Group.

As illustrated in Table 3, recipients of a hip or knee replacement surgery differed by age, sex, race/ethnicity, and income. While fewer males received replacement surgery, they were slightly (RRR = 6%, $P < 0.001$) more likely than females to have replacement surgery. The likelihood of surgery decreased with age. Compared to those in the age 65–74 group, those who were age 75–84 years old were only about 80% ($P < 0.001$) as likely, and those who were older than age 85 were only about 50% ($P < 0.001$) as likely to have replacement surgery. Patients who live in lower income areas were 5%–10% less likely to receive a hip or knee replacement, compared to those who reside in higher income areas. Finally, patients who reside in high-minority areas were about 20% ($P < 0.001$) less likely to receive a hip or knee replacement as those who reside in low minority areas.

Use of hip or knee replacement surgery varied across most of the control variables measured (Tables 3 and 4). Patients who reside in rural areas were 14% ($P < 0.001$) more likely to receive a surgery than those in metropolitan areas. Compared to the reference state (New Jersey), patients who live in certain western states were several times more likely to receive replacement surgeries. For example, beneficiaries residing in South Dakota and Idaho were, respectively, 3.25 ($P < 0.001$) and 2.58 ($P < 0.001$) times as likely to receive hip or knee replacement as those who live in New Jersey. Residence in the future survey areas was not a significant predictor of surgery, but those who live in the future disease management areas were only 0.84 times as likely ($P < 0.001$) to receive a hip or knee replacement.

Table 3. Factors Associated with Hip/Knee Replacement According to Multivariate Analysis

Variable		*Coefficient*	*Standard Error*	P *value*	*Relative Risk Ratio*
Age	75–84 years	−0.2335	0.0133	<0.001	0.7947
	85 years and older	−0.8087	0.0202	<0.001	0.4501
Sex	Male	0.0627	0.0126	<0.001	1.0634
Income	Upper medium income	−0.0088	0.0154	0.566	0.9914
	Lower medium income	−0.0502	0.0181	0.005	0.9519
	Low income	−0.1172	0.0253	<0.001	0.8913
Minority Status	Standard minority	−0.0818	0.0142	<0.001	0.9229
	High minority	−0.2344	0.0413	<0.001	0.7943
Urban status	Micropolitan	0.0974	0.0191	<0.001	1.1002
	Rural	0.1338	0.0237	<0.001	1.1403
Programming	DM Pilot	−0.1753	0.0253	<0.001	0.8418
	Survey Pilot	0.0298	0.0574	0.604	1.0296
Medigap Plan	B	0.0955	0.0529	0.071	1.0983
	C	0.1005	0.0399	0.012	1.1038
	D	0.0834	0.0549	0.129	1.0854
	E	0.0491	0.0507	0.333	1.0494
	F	0.1286	0.0393	<0.001	1.1347
	G	0.0846	0.0533	0.113	1.0867
	H	0.0619	0.0737	0.401	1.0628
	I	0.0684	0.0473	0.148	1.0695
	J	0.0885	0.0417	0.034	1.0909
	K	0.1918	0.3729	0.607	1.2072
	L	0.3474	0.2864	0.225	1.4060
	Pre-Standardized	−0.0944	0.0421	0.025	0.9114
	Waiver and nonstandard plans	0.1798	0.0627	0.004	1.0876
Risk Score	Risk Score	0.2207	0.0048	<0.001	1.2412
Comorbidities	Mental Health	−0.0915	0.0232	<0.001	0.9142
	COPD	−0.3664	0.0343	<0.001	0.6975
	Hypertension	0.5896	0.0127	<0.001	1.7891
	CAD	0.0889	0.0135	<0.001	1.0912
	Diabetes	−0.0976	0.0159	<0.001	0.9087
	CHF	−0.2282	0.0240	<0.001	0.7993
	Obesity	0.5992	0.0390	<0.001	1.7962

Reference groups: Age: 65–74; Sex: Female; Annual Income: High income; Minority status: Low minority; Medigap Plan: A; Programming: No Disease Management; Urban status: metropolitan; Comorbidities: not present.

CAD, coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; DM, disease management.

Medigap plan type was not a strong predictor of the likelihood of hip or knee replacement. Patients in plan type F (RRR = 1.13, $P < 0.001$) and those in the waiver and nonstandard plans (RRR = 1.08, $P = 0.004$) were significantly more likely to have surgery compared to those in plan type A (the reference group). Membership in the other plans did not significantly influence surgery rates. Health status was a strong predictor of hip or knee replacement surgery. Sicker patients, as measured via the ERG risk score, were more likely to have a surgery. For every 1-point increase in the ERG score, the likelihood of surgery increased by 24% ($P < 0.001$). The presence of certain comorbidities was associated with disparities in hip or knee surgery. Patients diagnosed with obesity (RRR = 1.80, $P < 0.001$), hypertension (RRR = 1.79, $P < 0.001$), or CAD (RRR = 1.09, $P < 0.001$) were significantly more likely to receive a hip or knee replacement surgery than patients without these conditions. Patients with a mental health condition (RRR = 0.91, $P < 0.001$), COPD (RRR = 0.70, $P < 0.001$), diabetes (RRR = 0.91, $P < 0.001$), or CHF (RRR = 0.80, $P < 0.001$) were less likely to receive hip or knee replacement surgery.

Results of the sensitivity analyses

The output from the additional sensitivity models is not presented in detail here for brevity, and because they were largely consistent with the combined (any-hip-or-knee) model. However, detailed results are available from the corresponding author upon request. When comparing the results of the any-hip, any-knee, and combined models, 70 of the 84 independent variables that were included in the models, (ie, 83.7% of the variables) had the same sign and significance levels as in the primary analyses. When the any-knee ($n = 19{,}831$), total knee ($n = 17{,}823$), partial knee ($n = 955$), and revision knee ($n = 1241$) model results were compared, 48 (ie, 58%) of the variables had the same sign and significance levels across the models. When the results of the any-hip ($n = 12{,}946$), total hip ($n = 8900$), partial hip ($n = 3088$), and revision hip ($n = 1210$) models were compared, 59 (ie, 70.2%) of the variables had the same sign and significance across the models. The sample size for any-hip or any-knee does not equal the sum of total, partial, and revision because some patients had more than 1 surgery.

Table 4. Number and Percent of Sample Members Who Received Surgery by State of Residence, and Impact of Location on the Likelihood of Having Surgery

	Descriptive				*Multivariate*			
State	*Number of patients with osteoarthritis*	*Percentage of patients with hip/knee surgery*	*Standard deviation*	P *value*	*Coefficient*	*Standard Error*	P *value*	*Relative Risk Ratio*
AK	690	10.29%	30.40%	<0.001	0.931	0.141	<0.001	2.492
AL	2,768	5.53%	22.86%	<0.001	0.237	0.104	0.023	1.263
AR	2,819	6.42%	24.52%	<0.001	0.447	0.099	<0.001	1.552
AZ	12,037	7.29%	25.99%	<0.001	0.451	0.043	<0.001	1.558
CA	35,680	6.23%	24.17%	<0.001	0.458	0.066	<0.001	1.57
CO	6,070	8.12%	27.32%	<0.001	0.66	0.053	<0.001	1.913
CT	14,441	6.43%	24.53%	<0.001	0.301	0.071	<0.001	1.345
DC	850	5.06%	21.93%	<0.001	0.237	0.17	0.164	1.263
DE	3,056	6.54%	24.73%	<0.001	0.31	0.097	0.001	1.357
FL	43,939	6.00%	23.75%	<0.001	0.266	0.065	<0.001	1.299
GA	16,253	5.80%	23.37%	<0.001	0.281	0.071	<0.001	1.319
HI	440	6.59%	24.84%	<0.001	0.542	0.205	0.008	1.704
IA	2,912	6.90%	25.35%	<0.001	0.56	0.097	<0.001	1.734
ID	1,607	10.02%	30.03%	<0.001	0.966	0.105	<0.001	2.577
IL	17,535	5.17%	22.14%	<0.001	0.306	0.071	<0.001	1.352
IN	17,655	6.45%	24.56%	<0.001	0.356	0.069	<0.001	1.42
KS	4,362	6.30%	24.31%	<0.001	0.439	0.088	<0.001	1.541
KY	8,665	5.59%	22.97%	<0.001	0.18	0.078	0.02	1.194
LA	3,762	4.55%	20.83%	<0.001	0.14	0.1	0.165	1.147
MA	4,486	5.93%	23.62%	<0.001	0.264	0.096	0.006	1.297
MD	11,219	6.27%	24.24%	<0.001	0.351	0.074	<0.001	1.413
ME	5,764	7.95%	27.05%	<0.001	0.569	0.079	<0.001	1.75
MI	8,541	7.17%	25.79%	<0.001	0.498	0.075	<0.001	1.632
MN	1,447	9.33%	29.09%	<0.001	0.882	0.114	<0.001	2.375
MO	14,117	6.18%	24.07%	<0.001	0.349	0.043	<0.001	1.41
MS	3,133	5.36%	22.53%	<0.001	0.315	0.101	0.002	1.364
MT	1,576	9.01%	28.64%	<0.001	0.871	0.109	<0.001	2.35
NC	16,584	7.05%	25.61%	<0.001	0.556	0.07	<0.001	1.728
ND	469	8.74%	28.28%	<0.001	0.769	0.177	<0.001	2.128
NE	1,731	7.86%	26.91%	<0.001	0.728	0.11	<0.001	2.045
NH	3,832	7.39%	26.16%	<0.001	0.562	0.088	<0.001	1.738
NJ	43,742	4.86%	21.50%	*Reference*	*Reference*	*Reference*	*Reference*	*Reference*
NM	3,270	6.06%	23.85%	<0.001	0.439	0.097	<0.001	1.541
NV	2,538	7.49%	26.32%	<0.001	0.516	0.098	<0.001	1.662
NY	49,098	5.02%	21.83%	<0.001	0.114	0.066	0.084	1.119
OH	33,289	6.13%	23.98%	<0.001	0.348	0.066	<0.001	1.408
OK	4,802	5.52%	22.84%	<0.001	0.298	0.089	0.001	1.341
OR	3,911	8.16%	27.37%	<0.001	0.716	0.086	<0.001	2.02
PA	25,471	5.62%	23.03%	<0.001	0.218	0.068	0.001	1.24
RI	972	4.32%	20.34%	<0.001	−0.09	0.17	0.598	0.915
SC	7,161	5.88%	23.52%	<0.001	0.352	0.08	<0.001	1.414
SD	602	11.79%	32.28%	<0.001	1.203	0.143	<0.001	3.246
TN	6,819	5.63%	23.05%	<0.001	0.278	0.081	0.001	1.315
TX	33,761	6.43%	24.54%	<0.001	0.41	0.057	<0.001	1.497
UT	2,179	8.63%	28.08%	<0.001	0.842	0.099	<0.001	2.284
VA	13,135	5.65%	23.09%	<0.001	0.289	0.073	<0.001	1.329
VT	2,961	8.48%	27.86%	<0.001	0.661	0.091	<0.001	1.914
WA	12,349	8.72%	28.22%	<0.001	0.726	0.07	<0.001	2.04
WI	6,010	7.65%	26.59%	<0.001	0.703	0.087	<0.001	1.995
WV	7,517	5.48%	22.76%	<0.001	0.221	0.081	0.006	1.244
WY	1,625	10.89%	31.16%	<0.001	0.966	0.102	<0.001	2.579

A baseline (preintervention) version of the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey was conducted in the 5 pilot states (ie, parts of New York, Ohio, Florida, California, North Carolina) and in the other 5 states (Arizona, Colorado, Missouri, New Jersey, Texas) listed above in 2008. Postintervention period surveys will be conducted in 2009 and beyond.

Discussion

In this study of osteoarthritic patients with Medigap coverage, the prevalence of osteoarthritis (26%) and the hip or knee replacement rate (14.7 per 1000) is consistent with previous estimates.[30,31] Despite the increased socioeconomic status of those with Medigap insurance relative to the Medicare population as a whole, we found disparities in hip or knee replacements associated with patient demographics, socioeconomics, and health status. Most previous studies of disparities in joint replacement have separated hip and knee surgeries and further delineated between total, partial, and revision procedures. The authors chose to combine all of these into a single model in part to increase the size of the study population, because of their overlapping etiologies, and because the sensitivity analysis revealed consistency across the models. These results were less consistent between the partial and revision procedures, but because these only represent 18% of all surgeries, the authors are confident that combining the models provided reasonably accurate results for consideration.

The findings for age and sex are not entirely consistent with other studies on Medicare populations. Several studies using Medicare FFS populations have found that women have modestly higher rates of hip and knee replacement than men.[5,7,16,17] In this study, men were modestly (6%) more likely to receive such surgeries. Other studies have shown higher rates of hip and knee replacement surgery up to age 75–79, with lower rates for older patients.[10,16,17] In this study, the highest rates were among those aged 65–74, with lower rates for older patients. These discrepancies are likely the result of different study designs. Specifically, the authors utilized more recent data, but over a shorter time horizon, and focused more narrowly on osteoarthritis patients with Medigap coverage.

The findings for income and minority status are consistent with other studies indicating that minorities[6,8,10–12,16,17] and lower income members[16,17] were less likely to receive hip or knee replacement surgeries. Although significant, income-related disparities were modest in size, perhaps because our study sample included relatively wealthy Medigap enrollees.

There were differences in procedure use for several of the control variables, with geography and the presence of certain comorbidities being associated with the largest disparities. The authors found that patients living in certain western states were much more likely to receive hip or knee replacement surgery, which is consistent with other studies.[16,17] In addition, patients residing in rural areas were 1.14 times as likely to have hip or knee replacement surgery, which is consistent with other findings.[32]

Previous studies have not concentrated to a great degree on how the presence of comorbidities influenced the likelihood of hip or knee replacement surgery. These disparities were among the largest in our study. We found that patients diagnosed with hypertension, CAD, and obesity were more likely to receive replacement surgery, whereas patients with mental health conditions, diabetes, CHF, or COPD were less likely to receive surgery. In the case of diagnosed obesity (which often does not occur until obesity-related problems are significant), our findings are consistent with research showing positive associations between obesity and total hip and knee replacement surgery.[33]

Innovations to address these disparities began in 2009. Specifically, in mid-2009, AARP members obtained access to a Treatment Decision Support (TDS) program that aims to increase patient awareness regarding appropriate treatment choices for hip and/or knee problems (among other problems). Under the TDS program, members who may be considering hip or knee surgery are contacted by telephone and asked to discuss treatment choices; they also receive mailed materials about these alternatives. We hope that better education resulting from these telephone and mailed interactions will lead to fewer disparities. This hypothesis will be addressed when the TDS program is evaluated in the coming year.

Several limitations to this study must be noted. This study focused on Medigap insureds and individuals with AARP-branded Medigap coverage underwritten by a single insurer, UnitedHealthcare. While this data set was quite large (2.2 million AARP Medigap insureds), it represents only a small fraction of the Medigap population and even less of the Medicare population. Thus, these findings may not be generalized beyond these groups, even though this was a relatively large study population. Additionally, the authors focused on a single 12-month period; therefore, conclusions about disparities over longer periods cannot be made. The use of zip code data to estimate racial disparity is imperfect. The accuracy of geocoding may vary, depending on whether data are used from zip codes or census tracts, how minority status is assigned, and the extent of segregation in these geographic areas, in that the geocoding-based measurements are more accurate when the geographic areas are more racially segregated.[22] Lastly, this study focused on patients with osteoarthritis. However, hip and knee replacement surgeries are performed for other reasons (eg, joint injuries, rheumatoid arthritis, bone tumor) that are far less common.[34] In this study, more than 90% of the replacement surgery claims had an osteoarthritis-related diagnosis (eg, diagnosis for osteoarthritis, pain, joint replacement).

This study was one of the first to focus on disparities in hip and knee replacement surgery in a population with Medigap coverage. Disparities by race/ethnicity and income were modest and consistent with previous studies. However, the authors found that males were slightly more likely to have hip/knee replacement surgeries and that use of surgery is most heavily concentrated in younger Medigap patients, which is not consistent with previous studies. Finally, some of the largest disparities were related to state of residence and the existence of comorbid conditions. Looking forward, interventions to address these disparities are under consideration.

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Author Disclosure Statement

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